A smart and sustainable urban future

Article

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This is the age of the city. More than 50% of the world's population lives in cities – a figure that is set to grow to 66% by 2050. Much of this growth is occurring in developing countries in mega-cities, but also in smaller and medium-sized cities in the developed and developing world.

This unprecedented urban growth presents huge opportunities, because cities can act as vibrant hubs of innovation, enterprise and jobs growth, and as places that create economies of scale in technology deployment. However, this development can also present substantial challenges, as more greenhouse gas emissions are created, more resources are depleted, more energy is consumed, and larger, dense populations become increasingly vulnerable.

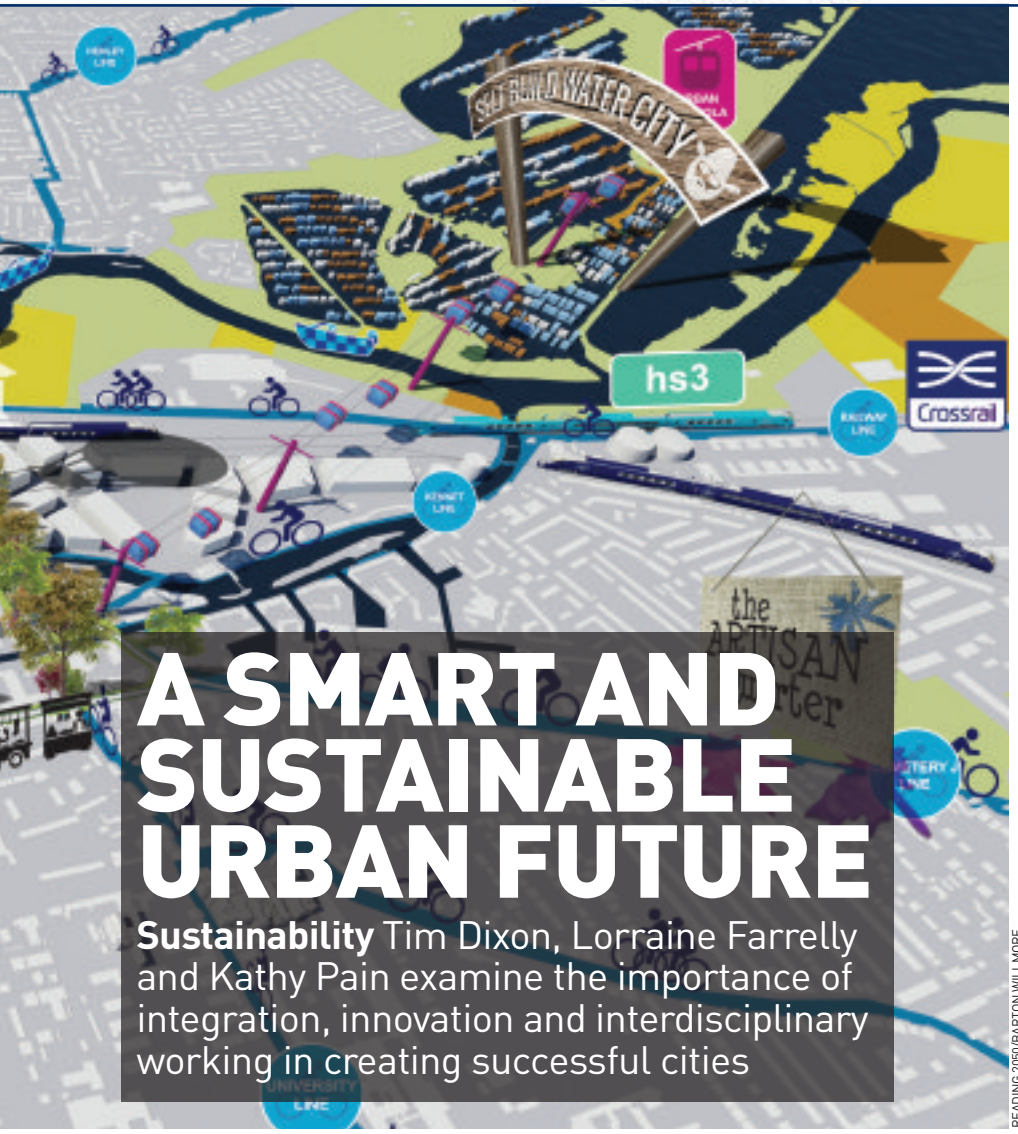
The emergence of big data techniques provides rich and diverse research opportunities that can help to provide solutions to some of the most pressing urban challenges.

Smart city model

Recently the "smart city" model has gained further traction, as commercial companies have seen a growing market for the future development of smart city technologies, and the supply of "big data" (or huge, dynamic datasets) has increased.

Proponents argue that technology can be leveraged to enhance economic development and quality of life, and that the increasing availability and integration of big data can be used to underpin these goals. Information for decision-making at a range of scales is therefore vital, and further enhanced by the rapid development of pervasive technologies, such as mobile devices and ubiquitous computing, both in cities and people's daily lives.

However, the smart city concept in its purest sense presents substantial challenges, and there is a real danger that, by focusing exclusively on the alluring "smart" technology aspects of cities, this



READING 2050/BARTON WILLMORE

A SMART AND SUSTAINABLE URBAN FUTURE

Sustainability Tim Dixon, Lorraine Farrelly and Kathy Pain examine the importance of integration, innovation and interdisciplinary working in creating successful cities

distracts and deviates us from following a truly sustainable path of urban development. This is vital to bear in mind given that the majority of the buildings (and cities) in the developed world are likely to still be here in 2050, and so the main focus has to be on ensuring that existing cities are both smart and sustainable.

Integrated thinking

Recent research at the University of Reading – *Smart and Sustainable: Using Big Data to Improve People's Lives in Cities* – suggests that cities should be thought of in three main ways.

First, cities need to develop an integrated approach to smart and sustainable thinking, which joins up the best elements of smart technologies and sustainable practices. Developing inclusive visions for cities is fundamental to this goal, and putting people at the heart of any future vision for a city is critical to success. Although there is no single agreed definition of a smart city, smart city thinking typically sees pervasive technologies (including, for example, telecom networks, transport and infrastructure systems, sensors, meters and other networked systems) as offering the ability to connect, integrate and analyse data to enhance the efficiency and effectiveness of cities. The powerful drive

inside

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FOUR KEY THEMES IN A SMART AND SUSTAINABLE CITY

ECONOMY
Employment
GDP
Market – glocal
Viability
Investment
PPP
Value chain
Risk
Productivity
Innovation
Compensation

GOVERNANCE
Regulatory
Compliance
Processes
Structure
Authority
Transparency
Communication
Dialogue
Policies
Standards
Citizen services

ENVIRONMENT
Sustainable
Renewable
Land use
Biodiversity
Water/air
Waste
Workplace

SOCIETY
People
Culture
Social networks
Tech savvy
Demographics
Quality of life
User experiences
Equal access
End consumers
Community needs
The city as a database

for smart cities is understandable, as there is a substantial estimated market potential of $400bn (£259bn) by 2020, of which 10% could be reaped by the UK, according to the Department for Business Innovation and Skills.

Smart city view

Data, however, does not exist in a vacuum, and people use technologies and react and behave in the context of their social practices and learning, so placing citizens centre-stage in a smart city view of the future is vital. This means not only understanding the context of the data generated, but also understanding how governance systems can be framed to protect privacy and confidentiality, as well as ensuring that people across a city have access to appropriate technologies, and making sure that there is a recognition that each city is different.

This also means that to understand how cities respond to urban challenges, an integrated approach to thinking about four key themes needs to be created (see box) – society economy environment and governance.

Developing long-term visions for cities not only helps to overcome the disconnection between short-term planning horizons and long-term environmental change, but also opens up a space to think beyond the short term to a plausible future.

Many cities in the UK and internationally are therefore building visions of how they see their future to 2020, 2050 and beyond, and this thinking is also at the heart of the UK BIS/GOS Future of Cities Foresight Programme. For example, cities that have the best visions and plans in place are likely to attract continued investment, and this has implications for property development and investment.

Thinking about cities in this way also requires an understanding of emerging and growing networks of cities. Cities research at the University of Reading has used a network approach to gain a deeper understanding of the links between cities at diverse geographical scales in an era of ICT-driven world urbanisation. This has examined not only the acceleration of global flows of information, finance and people between cities, but also the drivers of new agglomeration, cluster and innovation geometries which, despite increasing advances in ICT, reflect the continued importance of physical proximity in urban development.

New research employing "smart specialisation mapping" of spatially networked sector, labour and scale specialisations can then also inform the design of strategic governance frameworks, and provide a better understanding of polycentric mega-city regions at a variety of geographic scales (for example, Reading/South East England, or mushrooming super-urban regions in emerging economies).

Secondly, cities need to recognise the benefits of using big data to improve the quality of life for its citizens through improved decision-making and better information and customer service. This needs to recognise the challenges around privacy and security.

READING 2050

This project is a partnership between the University of Reading, Barton Willmore and Reading UK CIC to develop a smart and sustainable vision for the city through to 2050. It is based on Foresight techniques, and is focused on engaging with key stakeholders to develop a coherent and credible vision for Greater Reading. The vision has produced three urban design scenarios around green tech, festivals and culture, and rivers and parks.

URBAN INNOVATION ECOSYSTEMS

Urban innovation is a critical concept that lies at the heart of the big data revolution. To help tackle these challenges, urban innovation "ecosystems" need to be created that combine the expertise of civic society (including people and local government), business and academia (see diagram). This links very closely with the idea of creating urban innovation in cities, and has also led to the development of "urban transition laboratories" or "urban living laboratories", which are centres of reflexive learning and social innovation co-created by cities, business and academia.

Collaborative thinking

Finally, interdisciplinary thinking needs to be developed, and this must not only be at the heart of research and development in smart and sustainable cities and big data solutions, but also in professional practice in the built environment.

For example, since buildings and cities are built by teams of professionals from engineers and town planners through to architects and project managers, collaboration across professions and between industry and academia will be part of the learning experience in the new School of Architecture at University of Reading , which will also be developing a 3D physical model of the city to develop future thinking.

As Shakespeare wrote, "What is the city but the people?" Understanding this fundamental truth is critical to how thinking is developed around smart and sustainable cities.

Tim Dixon is professor of construction management and engineering, Lorraine Farrelly is professor of architecture and Kathy Pain is professor of real estate and planning at the University of Reading. *This article is dedicated to Peter Byrne, head of real estate & planning (1946-2015).*